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Evaluation of Pyrogenic Potential of Ethanolic Extract of Gnetum Africanum Leaves in Albino Rats

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Abstract
Owing to the belief held in this part of the world that the consumption of leaves of Gnetum africanum induces body heat, pyrogenic potential of extract of Gnetum africanum (afang) leaves in rats was evaluated to accept or reject this belief. Fresh leaves of Gnetum africanum were extracted by maceration. Potent and safe doses of the extract resolved from lethality studies were 250mg/kg, 500mg/kg, 750mg/kg, 1,000mg/kg, 1,250mg/kg, 1,500mg/kg, 1,750mg/kg and 2,000mg/kg.15 rats were used for the test. They were randomly divided into 3 groups of 5 animals each. Group I, the Control Group (CG) was treated orally with 10ml/kg of distilled water. Group 2, the Extract Group (EG) was administered orally with 1,000mg/kg (mid-dose) of extract. Group 3, the Yeast Group (YG) was treated intraperitoneally with 0.135mg/kg (pyrogenic dose) of baker's yeast. Rectal temperatures (T_R) were recorded every hour up to the 4th hour. T_R values at 0 hour were the basal T_R. The T_R values (in ^oC) for the EG were 37.54 ± 0.13, 37.64 ± 0.13, 37.72 ± 0.16, 37.94 ± 0.08 and 38.04 ± 0.05 for 0,1,2,3 and 4 hour(s) respectively. For CG, the values were 37.64 ± 0.04, 37.6 ± 0.05, 37.62 ± 0.05, 37.64 ± 0.02 and 37.62 ± 0.03 for 0, 1, 2, 3 and 4 hour(s) respectively. Comparing the T_R of the EG with those of CG, there were significant increases ($p<0.05$ and $p< 0.01$) at 3rd and 4th hours orderly, while the 0, 1st and 2nd hours showed no significant differences. The YG T_R values which were 37.48 ± 0.12, 37.5 ± 0.08, 37.6 ± 0.08, 38.04 ± 0.11 and 37.76 ± 0.11 for 0, 1, 2, 3 and 4 hour(s) accordingly, showed a significant increase ($p<0.05$) at 3rd hour compared with the CG while the 0, 1st, 2nd and 4th hours showed no significant differences.
Keywords: Pyrogenic Potential, Ethanolic Extract, *Gnetum africanum* Leaves, Albino Rats

1. Introduction

Gnetum africanum is one of the green leafy vegetables consumed in Africa, Asia and South America (Watt and Breyer- Brandwijk, 1962). Leafy vegetables contribute to the local diets as flavours, condiments, spices, drinks and beverages in most developing countries especially, Nigeria (Okafor, 1980; Ejiofor *et al* 1988). *Gnetum africanum* is a dioecious plant belonging to the family Gnetaceae. *Gnetum africanum* are wild under storey lianas that grow on trees in the humid forests of Africa (Mialoundama, 1993). The native names depend on regions: in Central Africa Republic, Gabon Republic, Congo Republic, Democratic Republic of Congo and in Angola Republic, it is called '*koko'* (Bahuchet, 1990). The English speaking population of Cameroon calls it '*eru'* while the French speaking population calls it '*okok'* (Temfack, 2007). In Nigeria, the Igbos call it '*okasi'* and the Efik/Ibibio call it '*afang'*. *Gnetum africanum* especially the leaves are the part that is mostly used. It is used in the treatment of enlarged spleen, sore throat and as a cathartic (Burkill, 1994). It is also used to reduce nausea and neutralize some poisons. It can be externally applied to boils and warts and is used to reduce the pain of childbirth (Burkill, 1994).

However, *Gnetum africanum* is most prized for its culinary use. The leaves of *Gnetum africanum* can be eaten raw and shredded and used in preparing soups and stews (Burkill, 1994). The consumption of leaves of *Gnetum africanum* and its medicinal applications in most African countries despite its relative unavailability and high cost indicate its importance as major dietary supplement.

In this part of the world, the consumption of leaves of *Gnetum africanum* is believed to cause body heat. This strong belief of no scientific basis prompted this study to determine whether administering ethanolic extract of leaves of *Gnetum africanum* will indicate alterations in the rectal temperature of albino rats, in comparison with an already established pyrogenic substance, the baker's yeast.

2. Methodology

15 albino rats of male sex weighing between 63g to 116g were randomly placed in 3 cages: Cage 1, Cage 2 and Cage 3. Each cage contained equal number of animals (i.e. 5 rats per cage). Cage I animals were the Control Group (CG). Cage 2 animals were the Extract Group (EG) and Cage 3 animals were the Yeast Group (YG).

The cages these animals were housed in were wooden cages with soft wood shavings as bedding. The room temperature where these cages were kept was maintained between 26^{o}C to 29^{o}C, relative humidity 60% to 70% and 12hr light- dark cycle throughout the tenure of the experiment. The animals were allowed to get acclimatized to this environment before experimentation. The rats were fed with normal commercial pellet, drank from tap water throughout the period of experiment.

The CG animals were orally given the solvent (distilled water) with the dose of 10ml/kg. The EG animals were orally treated with the ethanolic leaves extract of *Gnetum africanum*. The mid-dose of the extract

doses designed was chosen for administration (i.e 1,000mg/kg). The YG animals were injected intraperitoneally with a pyrogenic dose of baker's yeast (0.135mg/kg), (Danquah et al, 2011).

Rectal temperature (T_R) was measured by inserting a lubricated digital thermometer 2.8cm (external diameter 3mm) into the rectum of the rats. Rats in each group had their temperature measured before administration (basal T_R) and these were the measurements obtained at 0 hour. After treatment, the T_R changes were recorded every hour up to the 4th hour. This work was carried out between the early hours of 8am to 11am daily until the work was done with. The data collected were analyzed using t-test statistical tool, and the results obtained were graphically represented.

3. Results

The T_R values (in ^oC) for the EG were 37.54 ± 0.13, 37.64 ± 0.13, 37.72 ± 0.16, 37.94 ± 0.08 and 38.04 ± 0.05 for 0,1,2,3 and 4 hour(s) respectively. For CG, the values were 37.64 ± 0.04, 37.6 ± 0.05, 37.62 ± 0.05, 37.64 ± 0.02 and 37.62 ± 0.03 for 0, 1, 2, 3 and 4 hour(s) respectively. Comparing the T_R of the EG with those of CG, there were significant increases ($p<0.05$ and $p<0.01$) at 3rd and 4th hours orderly, while the 0, 1st and 2nd hours showed no significant differences. (See Figs. 1 and 2).

The YG T_R values which were 37.48 ± 0.12, 37.5 ± 0.08, 37.6 ± 0.08, 38.04 ± 0.11 and 37.76 ± 0.11 for 0, 1, 2, 3 and 4 hours accordingly, showed a significant increase ($p<0.05$) at 3rd hour compared with the CG while the 0, 1st, 2nd and 4th hours showed no significant differences. (See Figs. 1 and 3).

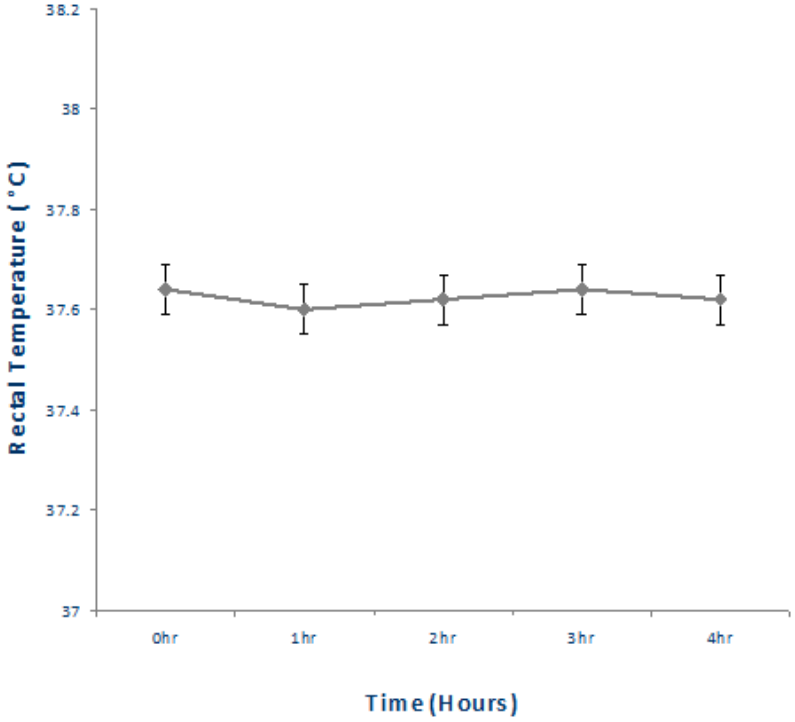

Fig. 1: Control rectal temperature following administration of distilled water in rats. Values are in Mean ± SEM.

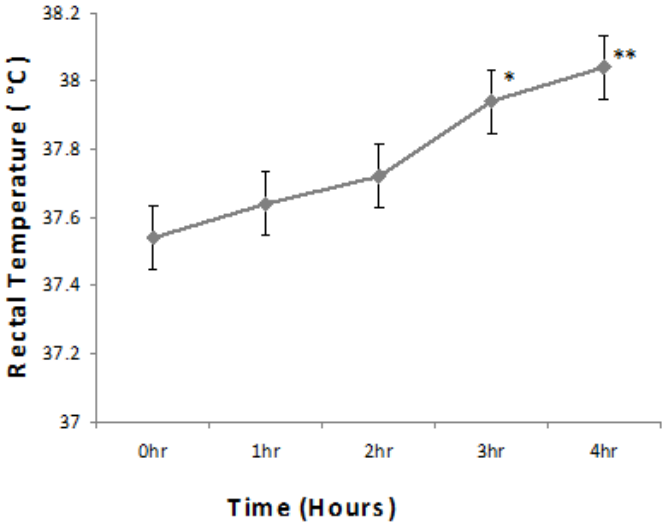

Fig. 2: Effect of *Gnetum africanum* leaves extract on rectal temperature in rats. Values are in Mean ± SEM, *= p<0.05, **= p<0.01.

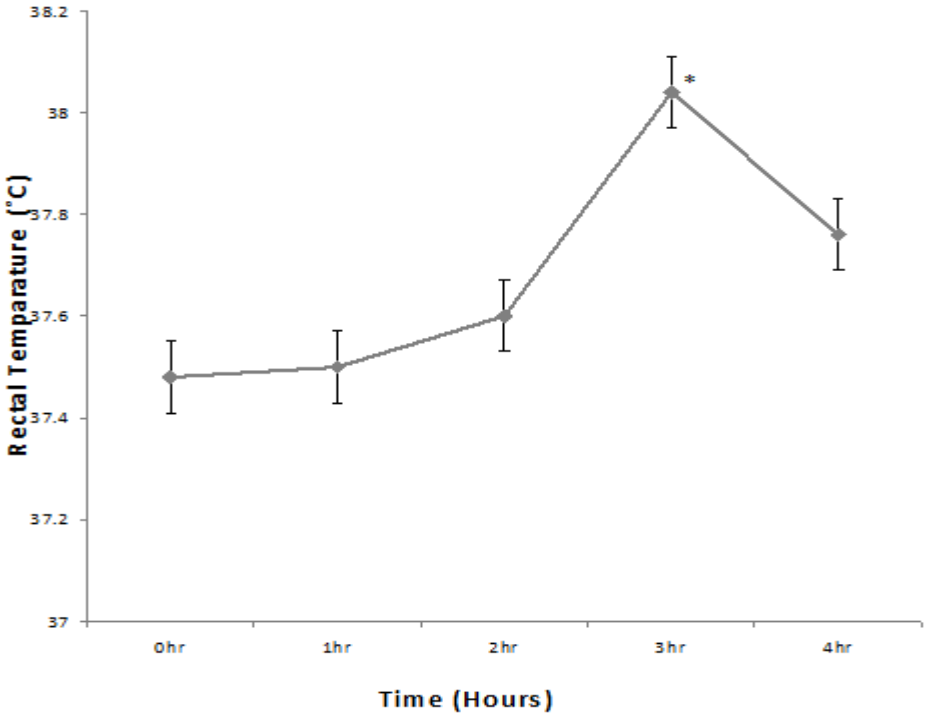

Fig. 3: Effect of baker's yeast on rectal temperature in rats. Values are in mean ± SEM, *= p<0.05.

4. Discussion

Among the consumers of the leaves in this part of the world is a complaint that its consumption induces body heat which was the reason for this experiment. The results of the study on the effect of *Gnetum africanum* leaves

extract on rectal temperature revealed that the extract caused increase in rectal temperature. It was observed that there was a gradual increase beginning from the 2nd hour after the extract administration and this increase progressed to the 4th hour. The increase was found to be significant at the 3rd and 4th hours while that of the 2nd hour was marginal. This shows that the extract has a progressive and a prolonged effect on the rectal temperature.

An already established pyrogenic substance, the baker's yeast was employed for comparison. The yeast was found to increase rectal temperature progressively from the 2nd hour and rose to a peak at the 3rd hour after which the rectal temperature began to drop. The temperature rise in the 2nd hour was also marginal.

Comparing the effect of the yeast on rectal temperature with that of the *Gnetum africanum* leaves extract, the results showed great similarity. The difference between the effects of the two substances on rectal temperature was observed at the 4th hour. The yeast induced rectal temperature began to drop at the 4th hour while the *Gnetum africanum* leaves extract induced rectal temperature rather observed to be higher at the 4th hour. This suggests that the *Gnetum africanum* leaves extract has more potent pyrogenic effect when compared with the baker's yeast.

Patel and Gallagher (2010) had reported that pyrogenic drugs cause fever by acting as a direct or indirect pyrogen or by causing inflammation or tissue damage. Other mechanisms advanced by this same author are by causing pyrogen release as part of its pharmacological action, by altering thermoregulation by central, peripheral, or metabolic means, by causing hypersensitivity reactions and by immunosuppression. Therefore, the extract might have used one or more of these ways to induce rectal temperature.

5. Conclusion

Comparing the pyrogenic effect of the baker's yeast with that of the extract of leaves of *Gnetum africanum*, it is observed that the effect of the latter is higher than that of the former.

6. Recommendation

All information presented in this research paper is authentic and the results of the research were obtained after conducting experiments of standard scientific procedures. The mechanism by which the *Gnetum africanum* leaves extract used to increase body temperature was not investigated in this study, therefore I recommend that this aspect of the work should be carried out.

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